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Internal Letter

Rockwell International

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SUBJECT. ESTABLISHMENT OF DETECTION LIMITS ON RADIOACTIVITY FOR OFFSITE SHIPMENT OF RECOVERED SILVER

In October of 1988, the Albuquerque Operations Office of the Department of Energy performed a follow up evaluation to the 1986 DOE Environmental Audit. The follow up evaluation resulted in the halting of all offsite shipments of wastes for recycling or incineration until HS&E Manual Chapter 21.01 was revised to reflect a limit on radioactivity of zero detectable. A project was initiated to determine what are essentially detection limits for various waste forms. Chapter 21.01 is scheduled for reissuance on September 1.

Recovered silver is a candidate material for offsite shipment for recycling and as such falls within the intent of DOE ALO in their instructions on Chapter 21.01. Data on plutonium and uranium were analyzed for the current stockpile and the detection limits have been developed.

Due to sample preparation errors, laboratory contamination, natural radiation in the environment, and counting errors, it is not possible to measure zero. An analysis of measurement values for silver and the 95% error result in the following recommendation for an offsite shipment test criteria.

1. If uranium or plutonium specific analysis results in a value equal to or greater than 0.3 pCi/g of activity, the silver is considered to be contaminated.

2. For values less than 0.3 pCi/g, the following test must be made (see Figure 1).

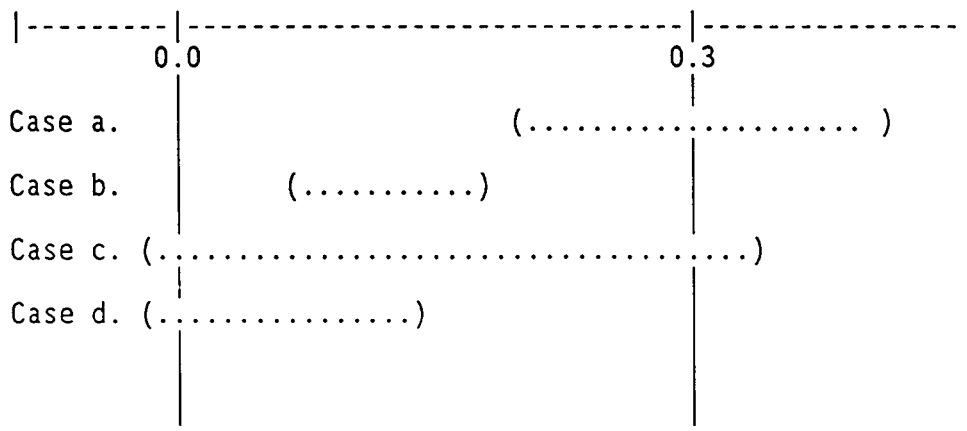
   a. If the measurement plus the 95% error bar is equal to or greater than 0.3 pCi/g, the silver is contaminated.

   b. If the measurement plus the 95% error bar is less than 0.3 pCi/g, but the measurement minus the 95% error bar is greater than zero, the silver is contaminated.

   c. If the measurement plus the 95% error bar is greater than or equal to 0.3 pCi/g and the measurement minus the error bar is less than zero the silver is contaminated. This case is quite important because it represents an inaccurate analysis that precludes verifying the absence or presence of radioactivity. In order to protect the buyer/user, this is considered contaminated.

d. If the measurement plus the error bar is less than 0.3 pCi/g and the measurement minus the error bar is less than zero, the silver is not considered contaminated.

FIGURE 1: ILLUSTRATION OF TEST CASES



Based on the analysis of the data, including the error terms, at measurements of 0.3 pCi/g and above, there is a virtual certainty that the material does contain radioactivity. At values less than 0.3 pCi/g, there is uncertainty as to whether or not a material actually does contain plutonium. The test described above evaluates this uncertainty and skews the decision toward protection of the buyer or user of the recovered silver (in this case by maximizing the Type II error).

The analysis of these data is based on a minimum of at least 1 gram of sample, and a minimum of a 12 hour count time. All samples should be analyzed for total uranium and plutonium. The laboratory analysis should be able to resolve to 0.03 pCi/g.

If you have any questions, please call Farrel Hobbs at extension 7006, or Denny Weier of Statistical Applications at extension 4194 for answers to questions on the statistical analysis.

F. D. Hobbs, Manager
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cc: F. P. Lawton
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